CLAIMS

What is Claimed is:

1.   A method for operating an implantable stimulation device, the method comprising:

stimulating heart tissue with stimulation energy;

obtaining information related to at least one of cardiac depolarization and cardiac contraction;

integrating the information to provide a value;

comparing the value with at least one parameter; and

implementing a technique in response to the comparing wherein the technique comprises at least one of capture techniques and fusion avoidance techniques.

2.   The method of claim 1, wherein the obtaining comprises receiving sensor data from at least one sensor positioned in one of the heart and proximal to the heart.

3.   The method of claim 1, wherein the integrating comprises integration of at least one of voltage and current information over a time interval.

4.   The method of claim 1, wherein the parameter comprises a statistical parameter.

5.   The method of claim 4, wherein the statistical parameter is based on historic information related to cardiac depolarization.

6.   The method of claim 1, further comprising storing the value.

7.   The method of claim 6, further comprising repeating the obtaining, the integrating and the storing to store a plurality of values.

8.   The method of claim 7, further comprising determining a statistical parameter of the plurality of values.

9.   The method of claim 1, wherein the parameter corresponds to a probability.

10.   One or more computer-readable media having computer-readable instructions thereon which, when executed by a programmable stimulation device, cause the stimulation device to execute the method of claim 1.

11.   A method for operating an implantable stimulation device, the method comprising:

stimulating heart tissue with stimulation energy;

obtaining information related to at least one of cardiac depolarization and cardiac contraction;

integrating the information to provide a value;

comparing the value with at least one parameter; and

implementing a fusion avoidance technique if the comparison indicates that fusion occurred.

12.   The method of claim 11, wherein the parameter comprises a sample mean of historic integral values minus a product, the product equal to a factor times a calculated deviation corresponding to the sample mean.

13.   The method of claim 12, wherein the factor comprises a number between approximately 1 and approximately 6.

14. The method of claim 13, wherein the statistical parameter comprises a calculated deviation of historic integral values.

15. The method of claim 11, wherein the fusion avoidance technique comprises pulse inhibition.

16. The method of claim 11, wherein the integral comprises an integral starting at cardiac depolarization.

17. The method of claim 11, wherein the integral comprises an integral starting at cardiac depolarization and ending at a baseline potential.

18. The method of claim 11, wherein the parameter corresponds to a probability.

19. One or more computer-readable media having computer-readable instructions thereon which, when executed by a programmable stimulation device, cause the stimulation device to execute the method of claim 11.

20. A method for operating an implantable stimulation device, comprising:

stimulating heart tissue with stimulation energy;

obtaining information related to at least one of cardiac depolarization and cardiac contraction;

deriving the information to provide a value;

comparing the value with at least one parameter; and

implementing a technique in response to the comparing

wherein the technique comprises at least one of capture techniques and fusion avoidance techniques.

21. The method of claim 20, wherein the obtaining comprises receiving sensor data from at least one sensor positioned in one of the heart and proximal to the heart.

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22. The method of claim 20, wherein the deriving comprises deriving a derivative of at least one of voltage and current information with respect to time.

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23. The method of claim 22, wherein the derivative comprises a positive derivative.

24. The method of claim 23, wherein the derivative comprises a maximum positive derivative in a time interval.

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25. The method of claim 20, wherein the parameter comprises a statistical parameter.

26. The method of claim 25, wherein the statistical parameter is

20 based on historic information related to at least one of cardiac depolarization and cardiac contraction.

27. The method of claim 20, further comprising storing the value.

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28. The method of claim 27, further comprising repeating the obtaining, the deriving and the storing to store a plurality of values.

29. The method of claim 28, further comprising determining a

30 statistical parameter of the plurality of values.

30.   The method of claim 20, wherein the parameter comprises a range of values.

31.   One or more computer-readable media having computer-readable instructions thereon which, when executed by a programmable stimulation device, cause the stimulation device to execute the method of claim 20.

32.   A method for operating an implantable stimulation device, comprising:

stimulating heart tissue with stimulation energy;

obtaining information related to at least one of cardiac depolarization and cardiac contraction;

deriving the information to provide a value;

comparing the value with at least one parameter; and

implementing a fusion avoidance technique if the comparison indicates that fusion occurred.

33.   The method of claim 32, wherein the at least one parameter comprises a range bounded by a sample mean of historic integral values plus a first product, the first product equal to a first factor times a calculated deviation corresponding to the sample mean, and the sample mean minus a second product, the second product equal to a second factor times a calculated deviation.

34.   The method of claim 33, wherein the first factor comprises a number between approximately 1 and approximately 6 and the second factor comprises a number between approximately 1 and approximately 6.

35.   The method of claim 32, wherein the fusion avoidance technique comprises pulse inhibition.

36. The method of claim 32, wherein the parameter corresponds to at least one probability.

37. One or more computer-readable media having computer-readable instructions thereon which, when executed by a programmable stimulation device, cause the stimulation device to execute the method of claim 32.

38. A method for operating an implantable stimulation device, comprising:

    obtaining information related to at least one of cardiac depolarization and cardiac contraction using at least one sensor;

    processing the information using a module to provide a value;

    comparing the value with at least one parameter using a microcontroller; and

    implementing a technique in response to the comparing using the stimulation device wherein the technique comprises at least one of capture techniques and fusion avoidance techniques.

39. The method of claim 38, wherein the processing comprises a process selected from the group consisting of integrating using an integration module and deriving using a derivation module.

40. The method of claim 38, wherein the at least one parameter comprises a statistical parameter.

41. The method of claim 40, wherein the statistical parameter comprises a parameter based on historic information related to at least one of cardiac depolarization and cardiac contraction.

42. The method of claim 38, wherein the at least one parameter corresponds to a probability.

5 43. One or more computer-readable media having computer-readable instructions thereon which, when executed by a programmable stimulation device cause the stimulation device to execute the method of claim 38.

44. A method for operating an implantable stimulation device,
10 comprising:

obtaining information related to at least one of cardiac depolarization and cardiac contraction;

processing the information to provide at least one value, the at least one value comprising a value selected from the group
15 consisting of integral values and derivative values;

repeating the obtaining and the processing to provide a plurality of values;

determining a parameter from the plurality of values, the parameter comprising a statistic;
20 obtaining additional information related to at least one of cardiac depolarization and cardiac contraction;

processing the additional information to provide at least one additional value;

comparing the at least one additional value to the
25 parameter;

implementing a technique in response to the comparing wherein the technique comprises at least one of capture techniques and fusion avoidance techniques.

30 45. A cardiac stimulation device comprising:

a sensor that is operative to obtain information related to at least one of cardiac depolarization and cardiac contraction; and

a processor operably coupled to the sensor, the processor
being configured to determine a value from the information, the
value comprising at least one of an integral value and a derivative
value, and being configured to determine a parameter from the
5   information, the parameter comprising a statistic.

46.   The device of claim 45, wherein the parameter corresponds
to a probability.

10   47.   The device of claim 45, wherein the processor is configured
to compare the value and the parameter.

48.   The device of claim 45, wherein the processor is configured
to implement a technique, the technique selected from the group
15   consisting of fusion avoidance techniques and capture techniques.

49.   An implantable cardiac stimulation device, comprising:
means for obtaining information related to at least one of
cardiac depolarization and cardiac contraction; and
20   means for determining a value from the information, the
value comprising at least one of an integral value and a derivative
value, and determining a parameter from the information, the
parameter comprising a statistic.

25   50.   The device of claim 49, wherein the parameter corresponds
to a probability.

51.   The device of claim 49, further comprising means for
comparing the value and the parameter.

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